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ERP IMPLEMENTATION, STRATEGIC COMPETITION AND CORPORATE PERFORMANCE : A THEORETICAL FRAMEWORK

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Abstract

Why or how ERP implementation would influence firm performance? The existing literature and practice did not address this issue clearly, but more focused on how to successfully implement ERP systems or what the impediments of ERP implementation were. We pointed out that a systematic framework was needed in order to understand the impact of ERP system on firm performance. In this paper, we developed a conceptual framework with the aim to open the black box of the relation between ERP implementation and firm performance based on strategic competition theory. Our paper contributed to the ERP literature by enriching our knowledge of the underlying mechanism through which ERP implementation took effect on corporate performance.

Keywords: ERP, Corporate performance, Strategic Competition Theory

1. INTRODUCTION

The rapid development of technology in 21st century drives the competitive advantage of enterprises transfer from the tangible resources to the intangible assets such as information technology. As an example of the application of information technology in the field of business management, ERP system has been invented and widely adopted by firms. ERP integrates business information flow, logistics and cash flow in order to optimize firm's internal processes and business procedures. Moreover, it can enhance enterprise's excavating capability, accelerate the pace of marketing, and facilitate business processes to create great value.

Despite of the wide application of ERP system in enterprises, the impact of ERP system on firm performance remains unclear and controversial. Some research suggested that ERP system had weak impact on corporate performance and firms could not capitalize on implementing ERP system (e.g., Grover et al, 1998; Pinsonneault, 1998). For example, Grover and coauthors' (1998) found that the information technology had limited impact on the corporate performance. Pinsonneault (1998) indicated that the impact of ERP implementation on firm performance was remote. On the contrary, some research suggested that ERP implementation could enhance firm performance and positively influence market reaction (e.g., Dos Santos et al, 1993; Perffers and Dos Santos, 1996, Hayers et al, 2001). For example, Dos Santos and coauthors (1993) indicated that the innovative technology could enhance the market value and performance of the company. Perffers and Dos santos (1996) found that there was a positive

correlation between IT investment and the company's performance. In a similar vein, Hayers and coauthors (2001) demonstrated that the adoption of ERP system was an innovative IT investment, and they also confirmed there was a positive correlation between the ERP system implementation and corporate performance. Hunton and coauthors (2003) found that the market had the positive reaction on the implementation of ERP system, and the implementation of ERP systems had a positive relationship with corporate performance.

In general, the results about the relation between ERP implementation and corporate performance are inconclusive. Poston and Grabski (2001) indicated that the implementation of ERP systems might have a positive influence on some performance indicators but have negative impact on other performance indicators. Some research have supported Poston and Grabski (2001)'s arguments, where they found that the implementation of ERP system did not directly enhance corporate performance, but could increase the performance of human resource management, logistics, sales and administrative management. However, this line of research is dispersed and thus cannot give an overview of the issue how ERP implementation could influence corporate performance. In addition, although some other studies tried to explore the diverse motivations of the firms to adopt ERP system such as increasing operation efficiency or technological innovation, they assumed that these motivations were equivalent to the mechanisms through which ERP took effect on firm performance. The entire above introduction suggests that we lack of complete and systematic knowledge about the impact of ERP implementation on corporate performance. In particular, the imbalance research focus in prior study makes the relation between ERP implementation and corporate performance become a black box and we have no clear clue why certain effect happens. A theoretical framework is needed which can integrates the diverse research streams of ERP implementation and gives us a clear explanation about how to implement ERP system to enhance corporate performance. Therefore, in the current paper, we take initiatives to explore the underlying mechanisms through which ERP implementation takes effect on firm performance based on literatures and theories about strategic competition. We construct a theoretical framework to explain how the ERP system could improve the resource management and dynamic capability of the firm, and how these competitive advantage brought by ERP implementation enhances corporate performance. The current paper is organized in the following way: we first introduce about two theoretical pillars of our conceptual framework---strategic competition theory and the nature of ERP system; and then we will present the conceptual framework about the mechanisms of the impact of ERP implementation on corporate performance; finally, we will discuss about the contribution and implication of our paper to the relevant research.

2. THEORETICAL BACKGROUND

This section is divided into two parts: the first part is a brief review about the theories of strategic competition---resource-based view and dynamic capabilities; the second part is an analysis of the nature of ERP system. These two analyses lay down the foundation of our conceptual framework development.

2.1 ERP and Firm Perfomance Literature Review

Some researches focuses on ERP implementation and finance performance. These studies regard financial indicators as firm performance. Poston and Grabski (2001) investigated the impact of ERP system implementation on firm performance. They examined the post-implementation performance of 50 ERP-adopting firms over a 3-year post-implementation time horizon, after controlling for pre-implementation performance. They found no significant improvement in residual income (net operating income less imputed interest for cost of capital) or in the ratio of selling, general and administrative expenses to revenue throughout the 3-year window. However, they reported a significant decrease in the ratio of employees to revenue in each of the 3 years and a significant improvement in the ratio of cost of goods sold to revenue in year 3.Overall, they noted that ERP firms exhibited efficiency gains in some areas, but increased costs elsewhere seemed to offset such gains. Other researchers have also indicated little or no relation between IT investment and financial performance, which is often referred to as the productivity paradox (Harris, 1994). However, as suggested by Dos Santos et al. (1993), delineating between innovative and non-innovative uses of IT could offer clarity in this regard. How then could it be that Poston and

Grabski (2001) examined the performance of companies that adopted an innovative IT investment (ERP system), yet found no significant gain in financial performance? While there are likely many answers to this question, one possible explanation suggested by Hitt and Brynjolfsson (1996) is that any financial gain associated with ERP adoption is passed through to customers in the form of lower prices. Robertson and Gatignon (1986) offered a similar explanation when they examined the impact of competitive factors on innovative technology diffusion. Through analytic modeling, Eliashberg and Jeuland (1986) discussed and Eliashberg and Chatterjee (1985, 1986) demonstrated that prices drop 168 J.E. Hunton et al. / Int. J. Account. Inf. Syst. 4 (2003) 165–184 immediately after the adoption of innovative technologies and demand increases as a result of price sensitivity. They further indicated that the financial performance of adopters might or might not improve significantly, depending on a host of exogenous factors such as competitive intensity, industry heterogeneity, demand uncertainty, and adoption rate of competitor firms; nevertheless, the performance of nonadopters would be expected to deteriorate by comparison in a competitive marketplace.

The other researchers provide other information as firm performance. Castka, et al (2001) cites that according to Stott and Walker, performance, in general, can be determined by three factors: ability; motivation; working environment and further, that this can be expressed by the equation Performance = ability x motivation x environment. Uden (2005) demonstrated that there are nine identified areas which contribute to influencing an organization's ability to achieve high performance.it is people who are the main factors, so it is necessary that the working environment is right and that people are managed in a way. Thus it will increase the level of performance and achievement. That improves morale and commitment, while encouraging them to manage the organization's processes in a way According to Colenso (see Castka et al, 2001), the preconditions to high performance are such things as purpose, empowerment, support and objectives, with characteristics being things such as interpersonal skills, participation, decision making, creativity and managing the external environment. Arnett et al (2002, p90) say that emotions, for example pride, have been linked to high quality service delivery and employees 'going out of their way' or 'beyond the call of duty'. According to Gollan, (2005, p26), overall, the sustainability of high performance work systems is predicated on organizations recognizing the needs of employees and implementing sustainable policies and practices to reinforce its values and principles through greater employee involvement and participation and also, by acknowledging the importance of employee satisfaction and commitment through the development of integrated employee consultation, organizational change, work and life policies, workplace institutions and comprehensive career development programs. Huang, et al, (2001) pointed out that ERP systems have been developed to provide a total business system in order to improve business performance whilst Markus et al (2000) pointed out that companies experience problems at all phases of the ERP system life cycle. The factors that affect these problems are of interest to this research and are collated in the next section.

In this paper, we cited strategic theory and regard gaining competitive advantage as firm performance. Our research found another angle to investigate the relationship between ERP implementation and firm performance. Although there were some researches which studied relationship between the competitive advantage and ERP implementation, this paper expands the concept of competitive advantage and explain the internal machinism that ERP implementation helps the organizations to gain competitive advantage, which was defined as firm performance in this paper.

2.2 Strategic Competition Thoery

One of the core research questions in the field of strategic management is how to enable companies to acquire and sustain competitive advantage in the competition. Two theories about strategic competition received most attention: resource-based view (e.g., Learned et.al 1969; Barney,1986) and dynamic capability (e.g.,). The former is about the resource efficiency competition, and the latter is about dynamic capabilities competition. Figure 1 gives an overview of strategic competition theory.

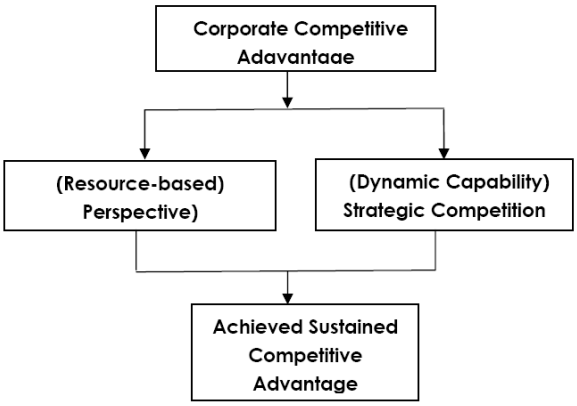

Figure 1. Illustration of Strategic Competition Theory

Resource-based view originally indicates that companies need to acquire abilities to gain competitive advantage in competition (Learned et.al 1969). Each company has its own advantages and disadvantages, and it is important to identify ways to gain competitive advantage through managing these strengths and weaknesses. Therefore, it is more important for the companies to figure out ways how to make use of the available resources than to respond to opportunities. Learned and coauthors (1969) point out that the success of the firms depends on whether firms could find or create a unique resource. Later studies suggest that, even using the same resources, different companies would create different values. They thus suggest the competitive advantage lies in firm's unique ability of resource management. There are mainly three reasons for the variation in firm's capacity of resource management: firstly, companies are different in terms of their ability to manage business processes complexity (e.g, Dierickx and Cool, 1989). Secondly, the nature of companies' assets is different which further causes differences in the transaction (e.g., Teece, 1976). For instance, the reward of the resources that cannot be traded such as the know-how technology, goodwill, and reputation, are significant different when they are put into market. Third, the economic benefits of the assets are different even if they can be traded. Barney (1986) indicates that unless they are fortunate enough to have abundant market information or conduct rent-seeking in the market, companies will never get the benefits from the market as they want. Resource-based view highlights two perspectives of strategic competition: vertical integration and diversification of the business. Both perspectives suggest that companies rely on their controllable resources to conduct rent-seeking behavior in the market (Wernerfelt, 1984). Wernerfelt and Montgomery (1988) confirmed this argument based on empirical results and suggested that the focus of the strategic competition was about how to develop and manage the corporate existing assets and resources.

In conclusion, the resource-based view treats the company as a system which doesn't acquire profitability in the traditional way of strategic investment such as raising prices or reducing costs. Instead, companies focus on developing ownership of the unique resources to gain profit and rent seeking, which is completely different from the traditional way of acquiring economic benefits through market competition. Resource-based view suggests that the competitive advantage lies in the upper reaches of the product markets and firm's capacity for managing resources that are difficult to imitate. The essence of the strategic competition from the perspective of the resource-based view is how the companies manage and use existing resources in order to achieve and maintain competitive advantage.

Dynamic capability refers to firm's ability to build, configure, and integrate both internal and external resources in order to meet the demands of the rapid market competition. The dynamic capability can help the enterprises to acquire new and innovative way of gaining competitive advantage, which further help companies to find a better and unique path to win out in the market competition. Dynamic capabilities theory suggests that the company has some unique resources which are difficult to imitate and enable the company to maintain the sustainable competitive advantage. The resources are different from the general assets that can be bought or sold and the

tradable assets cannot become completive advantage (Barney, 1986). To identify these differences, we can recall the difference between the company and the market. Coase (1937) points out that the essence of companies determines that companies are different from the market. Some economic activities organized in companies cannot be achieved through the market. These activities involve not only the matter of transaction costs but also high incentives, the effect of which can even replace the ones of cooperation and learning. Therefore, companies are not simply a microcosm of a market, or a narrow market, but have its unique capacity to engage in some activities which cannot be achieved in the market. The dynamic capabilities are the abilities companies use to organize and engage in a number of things which cannot be achieved by relying on the price system. Dynamic capacity cannot be obtained through the solely combination of market capabilities (Zander and Kogut, 1995). Fama (1980) suggests that the key that dynamic capacity is reflected by the combination of market capabilities is the contract. Through the contract, firms can use some means such as the legal agreements to strengthen the company's transactions, since these means will facilitate the creation of rewards, rights and responsibilities. Such organization built by the contracts is unique capability to each enterprise which cannot be reproduced by the market. The balance sheet is only one indicator of dynamic capability and there are more perspectives such as organizational structure, management structure, and management processes to understand dynamic capability. In this paper, we suggest that company's ability to completely contract reflects company's dynamic capability, and is reflected by company's governance structure. An optimal governance structure is a reflection of the good contract system, which enables the company to gain and maintain competitive advantage. Therefore, we argue that corporate governance can reflect a company's dynamic capability, and optimal corporate governance structure can help enterprises to gain competitive advantage.

To sum up, strategic competition theory suggests that whether firm could gain or maintain competitive advantage depend on the firm's strategic management on unique resources and dynamic capability.

2.3 The Nature of ERP System

ERP system is proposed by the United States Garter Group Inc at first, and has become one of the leading enterprise management models in today's international arena. Its main purpose is to integrate the resources owned by companies such as human resources, financial resources, material, information, time and space in order to balance and maximize efficiency. ERP is computer information system management software, which conforms to the American Production and Inventory Control Society (APICS) standards promulgated by MRPII. ERP also adopts the concepts in modern marketing management, modern logistics management, production management, just-in-time production (JIT), materials management, comprehensive quality management, financial management, human resources management. ERP takes the organizational characteristics into consideration and uses the information flow, capital flow and logistics as the core inputs for system architecture design and software development. ERP can effectively monitor and manage enterprise's manufacturing resources, financial resources and human resources. Therefore, the nature of ERP contains two aspects: first, ERP system is a computer information system, which produces information flow, capital flow and logistics (e.g., Brazel, 2005). In other words, ERP is a huge information system, and its major product is information which is related to all aspects of the enterprise management. Secondly, ERP system is a kind of comprehensive management of human resource, financial resource, and material resources. As a computer information systems ERP can monitor and manage company's manufacturing resources, financial resources and human resources during the whole manufacturing process.

To sum up, we can illustrate the nature of ERP systems through the following framework:

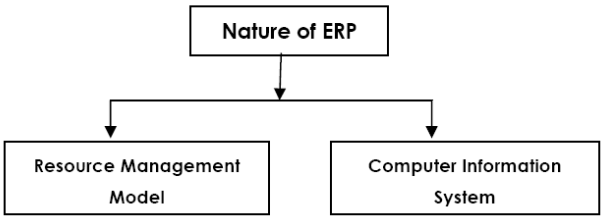

Figure 2. Nature of ERP System

ERP system is an information system that integrates all of the business information and information-based processes (Brazel, 2005). ERP system can integrate various functional modules of the enterprise, including financial information, human resource information, supply chain management information, and customer information (Nicolaou, 2004; Daventport, 1998; Kumar and Van Hillegersberg, 2000). ERP system will effectively integrate the enterprise capital flow, logistics and information flow, through the use of information technology. For instance, the statistics from the United States association of production and control indicates that the ERP system is very effective in terms of integrating resources:

- Reducing inventory including raw materials, working in process and finished goods inventory. Lowering occupancy (15% - 40%), increasing the number of stock liquidity (50% -200%), and reducing inventory errors (1% -2%).

- Use resources appropriately, shorten the production cycle, and improve the labor productivity. Such as reducing the space of production (10%-30%), reducing the overtime hours (10%-50%), reducing the shortage of parts (60%-80%), and increasing productivity (5% -15%).

- Ensuring in-time delivery and enhancing customer service quality. The rate of the in-time delivery is up to 90% and close to 100%.

- Reducing costs, such as production costs and time. Reducing costs by shortening the production cycle, reducing inventory (7% -12%), and increasing profits (5% -10%).

ERP system can therefore coordinate the operation of the system as a whole in order to achieve optimal performance. ERP could be treated as enterprise' neural network system, with the information flow from multiple levels (i.e., from the roots to the middle and high-level; and from the upper level to the middle and the roots). Information must be true, accurate and timely in order to ensure the effectiveness of organizations. The implementation of ERP system can enhance the efficiency of information transmission, which is mainly realized through the standardization of the information format, transmission channels, as well as early warning. The information produced by ERP is not only important for enterprise' internal management but also important for enterprise' external relationship management. The high quality of the information produced by ERP system can help the outside investors, regulators and other stakeholders understand the enterprise more accurately and correctly. In particular, in the current capital markets, the external stakeholders' demands of the information accuracy are increasing, which make the role of ERP system more important.

The function of ERP in enterprise can be categorized into two: 1) managing resources, such as enterprise's hardware including plants, production lines, processing equipment, testing equipment, transport equipment; and also enterprise's software including human resources, reputation, financing capacity, organizational structure, and staff morale. These resources interact with each other during the enterprises development and lay down the foundation for enterprises' production, the completion of customer orders, the creation of social wealth and enterprise value. The objects of ERP management are the above-mentioned various resources and elements of production. Through the use of ERP, enterprises can maximize the effectiveness of these resources, adjust decision

making according to the situation, and complete the customer orders timely and in high-quality. 2) Integrating and adjusting the use of enterprise resource, which is one of the important indicators of the enterprise' development. Before the use of management tools such as ERP, enterprise resource' condition and adjustment direction are not clear. The organizational structure of business could only be the pyramid structure, and the exchange and collaboration across inter-sectors are relatively weak. Therefore it's difficult to compare the operations of resources among different sectors. Making arrangement or adjustment is relatively difficult and takes a long time to do. The information technology, especially the enterprise resource management is invented and designed to solve these problems. The successful implementation of ERP will enable the enterprises to optimally utilize the resources.

3. THEORETICAL FRAMEWORK

From the above discussion, we can identify that there are many commonalities and connections between the nature of ERP system and the essence of competition strategy. To maintain competitive advantage and enhance performance, companies need a strong resource management capability and dynamic capabilities that is, the companies should be able to effectively control, integrate, and utilize the internal and external resources, and adaptive to environmental changes and competition. ERP system by nature is one resource management system, since ERP system itself is invented for material resource planning (MRP). ERP system is one model to manage, integrate, and control enterprise resources. This model intertwines with company's management culture, management processes and management objectives, and each enterprise application of ERP systems can be seen as the unique ability to manage resources. Therefore, we have reason to believe that the implementation of ERP systems can enhance the company's resource management capabilities and help the company gain a competitive advantage.

Moreover, as suggested by prior section, some scholars believe that the dynamic capability in essence is the contract which enables the company to respond to external changes flexibly and positively. This contract is reflected by the corporate governance which is the ability to solve the principal-agent problem. The nature of principal-agent relation is the contractual relationship between the clients and agents, and the composition of the contractual relationships is the issue of corporate governance. A large number of previous studies suggest that there is significant positive relationship between the corporate governance and corporate performance.. Good corporate governance can help the firm to acquire and maintain competitive advantage and further improve firm performance. Corporate governance is aiming to solve the principal-agent problem, and previous research suggest that the cause of principal-agent problem is the information asymmetry. In order to reduce the information asymmetry, we need timely and abundant information. One of the functions of ERP system is that as an information system ERP can provide a large amount of logistics, financial and management information, which not only timely but also accurately reflects the company's current operating state. At the same time, the financial information and analysis provided by ERP can help the external stakeholders to learn more about the company, and thus reduce the information asymmetry between the company and the external stakeholders. The characteristics of fast and accuracy of the computer systems can ensure information security to the external stakeholders. Therefore, to certain extent, ERP systems can help companies mitigate the information asymmetric problem, not only within the company's internal operations but also among management, shareholders, and external stakeholders. Therefore, we believe that the implementation of ERP system will mitigate company's information asymmetry problem, and thus reduce the company's principal-agent problem, which further improves corporate governance. The ERP implementation thus can enhance company's dynamic capabilities, which helps the company acquire and maintain competitive edge, and improve firm performance.

Therefore, the theoretical framework of the mechanisms through which ERP implementation takes effect on firm performance is illustrated as follows:

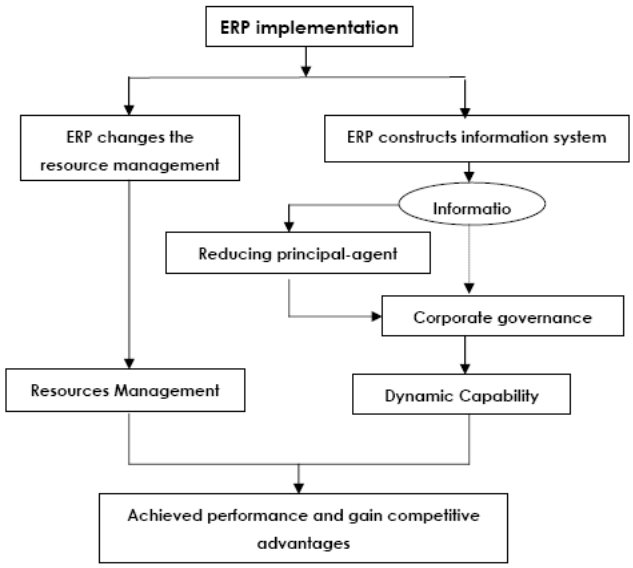

Figure 3. The Theoretical Framework of the mechanisms of the impact of ERP implementation on corporate performance

As illustrated in the above figure, ERP implementation will bring in two changes to the company which further influence firm performance: firstly, ERP implementation will change company's mode of resource management, where the resources do not only refer to the internal resources, but also include various controllable resources such as supply chain and customer relationship. Such change will improve company's resource management capabilities. According to the strategic competition theory, the improvement of resource management can help companies obtain and maintain competitive advantage, and enhance corporate performance. Such positive impact of ERP implementation on firm performance might not be reflected in the financial performance. The reason is that there are various factors influencing firm performance simultaneously, and in some cases the improvement of firm performance is counteracted by other side effects. Therefore, we need to use an independent indicator rather than the one which has been counteracted repeatedly to investigate the impact of ERP system on firm performance. In practice it is common to use the management accounting indicators. In addition, the ERP system can build a complete, timely and accurate information flow system inside and outside the company. This information system is not only useful for the internal management and coordination but also useful for a number of external stakeholders, since the information provided by ERP is reliable and trustworthy. The nature of the corporate governance is to solve the principal-agent problem, and reducing information asymmetry is necessary to solve the principal-agent problem. Therefore, the large amount of information generated by ERP systems is of considerable significance for the company to ease the principal-agent problem. The mitigation of Principal-agent problem indicates the improvement of corporate governance, and also the improvement of dynamic capability. Such improvement helps company to gain and maintain competitive edge, and enhance corporate performance.

4. CONCLUSION

ERP implementation has already been in hot pursuit inpractice, where it is believed that ERP system implementation will significantly improve the corporate performance and efficiency at the same time. However, scientific understanding about the impact of ERP system on firm performance is still fragmented and incoherent. Although the exsisting studies have found there is a correlation between ERP system implementation and corporate performance, they did not explain why there was such a relation. It seems that ERP system implementation could improve corporate performance and in order to improve corporate performance ERP system is implemented. Bussiness practitioners and academic researchers often have to face such a proposition in embarrassment. Our paper is trying to break this embarrassing situation and provide new perspective on research about ERP

implementation. In summary, we suggest that there are two mechanisms through which the implementation of ERP system takes effect on firm performance: firstly, ERP systems enhance firm performance by helping companies improve their modes of resource management; Secondly, the implementation of ERP systems enhances firm performance by improving corporate governance and company's dynamic capabilities. The theoretical framework is based on the strategic competition theory and a systematic analysis of the nature of ERP system, and therefore provides important theoretical basis for academic research and practices about the ERP system implementation.

Using strategic competition theory to open the black box of the relationship between the implementation of ERP system and corporate performance is an important contribution of our study tothe ERP research. There are some previous research which takes an interdisciplinary approach, for instance, accounting research focused on the relationship between ERP and various financial indicators. However, they did on explore the relationships among different indicators, and as a consequence, it's unclear about the why the implementation of ERP system could enhance firm performance. Information systems research on the other hand focused on how to design or implement ERP system, but they also take for granted that the implementation of ERP could enhance firm performance. We suggest that it is necessary to identify the factors which are beneficial to firm performance, andhen study whether the implementation of ERP systems has influence on these factors, in order to understand the mechanisms through which ERP takes effect on firm performance.

Our study has several implications to accounting research: The theoretical bases for accounting research are mainly from company theory and economic theory. We suggested that accounting research should pay more attention to the cross-disciplinary research. Theories in the research filed of management and finance could be more inspiring and thought provoking.

The implications to information systems research: similarly, we suggested that the information system research should also embrace a cross-disciplinary approach in order to have significant theoretical and practical influence. Most of the existing information systems studies relied on simulation and cross-disciplinary research could help these research return to practice. The current paper could provide some theoretical basis for future research about ERP information system.

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